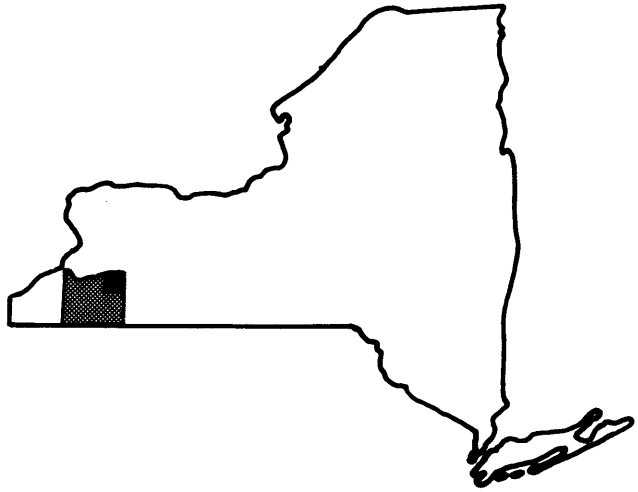
FLOOD INSURANCE STUDY

TOWN OF FREEDOM, NEW YORK
CATTARAUGUS COUNTY



REVISED:
AUGUST 19, 1991

Federal Emergency Management Agency

COMMUNITY NUMBER - **360074**

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial FIS Effective Date: May 25, 1984

Revised FIS Date: August 19, 1991

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FLOOD INSURANCE STUDY
TOWN OF FREEDOM, CATTARAUGUS COUNTY, NEW YORK

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the Town of Freedom, Cattaraugus County, New York. This information will be used by the Town of Freedom to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses in this study represent a revision of the original analyses prepared for the Federal Emergency Management Agency (FEMA). The hydrologic and hydraulic analyses for Clear Creek in this revision were prepared by the Buffalo District of the U. S. Army Corps of Engineers (COE). This work was completed in December 1989.

1.3 Coordination

On February 5, 1990, the Town of Freedom was notified by FEMA of the initiation of a revised Flood Insurance Study for the community.

On August 20, 1990, a final Consultation Coordination Officer's meeting was held with representatives of FEMA and the town to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Freedom, Cattaraugus County, New York. The area of study is shown on the Vicinity Map (Figure 1).

Clear Creek was studied by detailed methods from the Cattaraugus county boundary to the State Route 98 bridge. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction.

Portions of Clear Creek and several of its unnamed tributaries, and Elton Creek were studied by approximate methods. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

2.2 Community Description

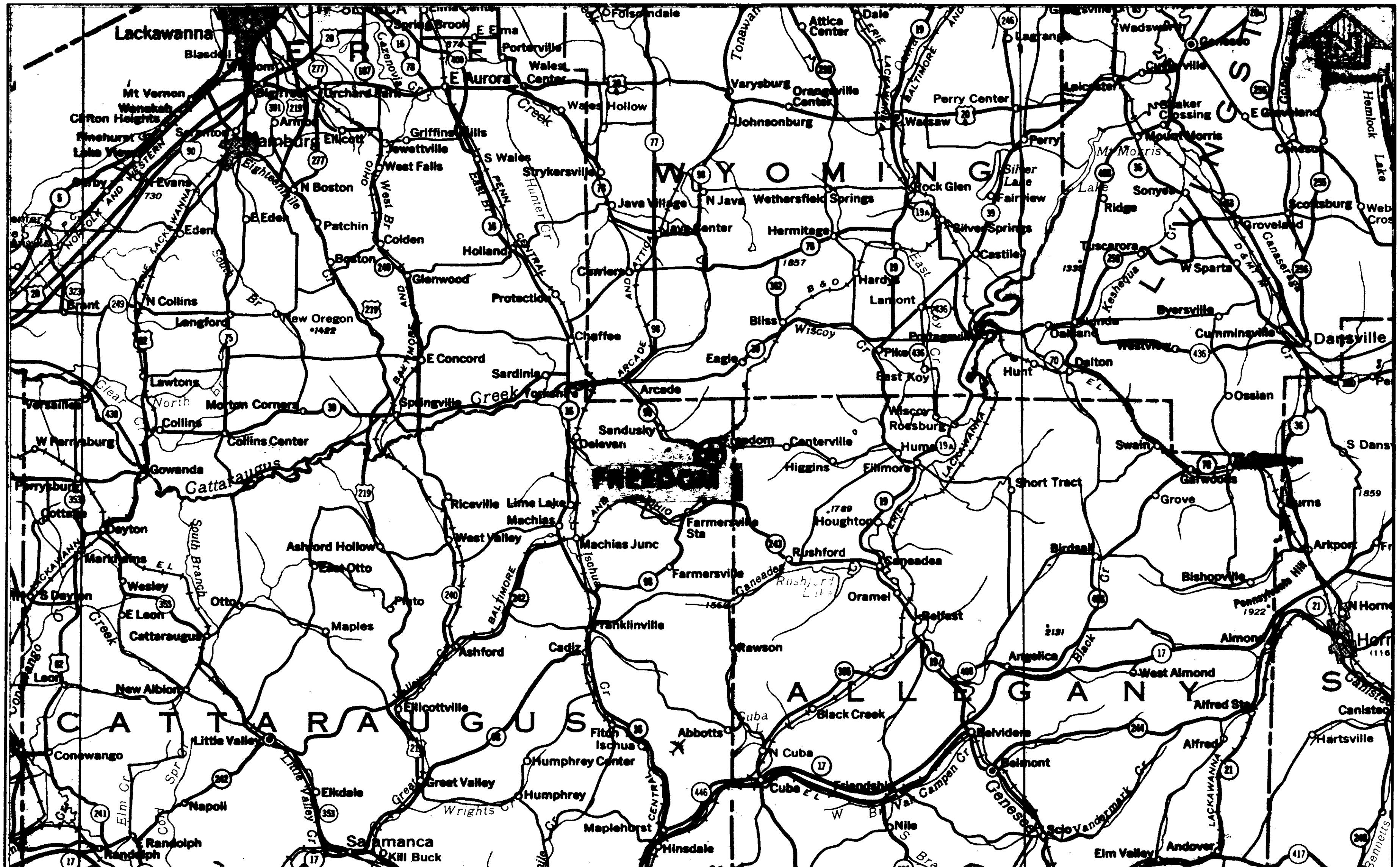
The Town of Freedom is located in Cattaraugus County in western New York, approximately 40 miles southeast of Buffalo. It is bordered by the Town of Arcade to the north, the Town of Centerville to the east, the Town of Farmersville to the south, and the Towns of Machias and Yorkshire to the west.

The climate of Freedom is continental, with cold winters and mild summers. The average annual precipitation is 40.98 inches, and the average annual temperature is 45 degrees Fahrenheit at the nearest climatological data station (Reference 1).

Clear Creek originates in the Town of Freedom, then flows northwest to the Village of Arcade and its confluence with Cattaraugus Creek. The watershed is characterized by relatively steep topography, with little storage. There are several small ponds in the headwaters of the watershed; however, their effect downstream is not significant.

2.3 Principal Flood Problems

Clear Creek is an ungaged stream. However, local newspaper articles indicate that flooding on Clear Creek occurred in 1902, 1971, 1972, 1984, 1985, and 1986 (Reference 2). Frequency interval for these floods is not known since no data are available. Local officials report that some bridges were destroyed in the 1986 flood.



FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FREEDOM, NY

(CATTARAUGUS CO.)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

FIGURE 1

2.4 Flood Protection Measures

No known flood protection measures have been instituted in the Town of Freedom.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. A flood event of a magnitude which is expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval) has been selected as having special significance for floodplain management and for flood insurance rates. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for the flooding source studied in detail affecting the community.

Clear Creek was divided into five reaches to most accurately define the hydrologic and discharge characteristics in the study area. The Kinematic Wave Method of the COE HEC-1 computer program was used to determine the 100-year peak discharge on Clear Creek (Reference 3). HEC-1 is a computerized method that has various options to simulate rainfall/runoff processes. The Kinematic Wave Method was applied to determine runoff and to simulate flood routing. The drainage basin of Clear Creek was divided into nine subbasins. For each subbasin, the following input data were used: (1) drainage area; (2) curve number; (3) overland flow length; (4) representative subbasin slope; (5) Manning's "n"; (6) channel length; (7) channel slope; (8) channel roughness; (9) channel shape; (10) channel width; and (11) channel sideslopes. A hypothetical storm was generated to produce the 100-year 24-hour precipitation.

A summary of the drainage area-peak discharge relationships for the stream studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGE (cfs) 100-YEAR
CLEAR CREEK		
At a point approximately 3,900 feet upstream of confluence with Cattaraugus Creek	32.8	7,000
At Bray Road bridge	26.1	5,300
At a point approximately 0.3 mile upstream of Eagle Street bridge	17.8	3,300
At a point approximately 0.17 mile east of Maple Grove Road	12.6	2,500
At a point approximately 0.15 mile upstream of Galen Hill Road bridge	9.5	2,100

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the source studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross section data for the backwater analyses were obtained from field surveys conducted for this study and from USGS topographic maps (Reference 4). All bridges and culverts were surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 5). The starting water-surface elevation for Clear Creek was determined using the normal depth method at a cross

section located approximately 5,190 feet downstream of the Bray Road bridge. Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the stream and floodplain areas. The channel "n" values for Clear Creek ranged from 0.035 to 0.060, and the overbank values ranged from 0.050 to 0.100. Contraction and expansion coefficients ranged from 0.100 to 0.300 for contraction and 0.300 to 0.500 for expansion of flows.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study, and their descriptions, are shown on the maps.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. For the stream studied in detail, the 100-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000 with contour intervals of 10 and 20 feet (Reference 4).

For the streams studied by approximate methods, the 100-year floodplain boundaries were delineated using the previous Flood Insurance Study for the Town of Freedom (Reference 6).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards

(Zones A and AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this study is presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodway presented in this study was computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodway is shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Clear Creek								
A	9,900	450	1,113	4.8	1,534.7	1,534.7	1,534.8	0.1
B	11,800	354	800	6.6	1,549.1	1,549.1	1,549.2	0.1
C	14,110	380	1,586	3.3	1,573.0	1,573.0	1,573.5	0.5
D	16,653	521	973	5.4	1,591.3	1,591.3	1,591.3	0.0
E	18,620	400	1,094	4.8	1,609.2	1,609.2	1,609.2	0.0
F	20,167	83	295	11.2	1,623.6	1,623.6	1,623.6	0.0
G	22,560	74	384	8.6	1,646.5	1,646.5	1,646.5	0.0
H	25,210	140	533	4.7	1,677.4	1,677.4	1,677.5	0.1
I	26,715	69	258	9.7	1,694.3	1,694.3	1,694.3	0.0
J	28,820	234	479	5.2	1,718.9	1,718.9	1,718.9	0.0
K	31,710	180	594	4.2	1,744.7	1,744.7	1,744.8	0.1
L	33,227	189	400	5.2	1,756.5	1,756.5	1,756.6	0.1

[1]Feet above confluence with Cattaraugus Creek

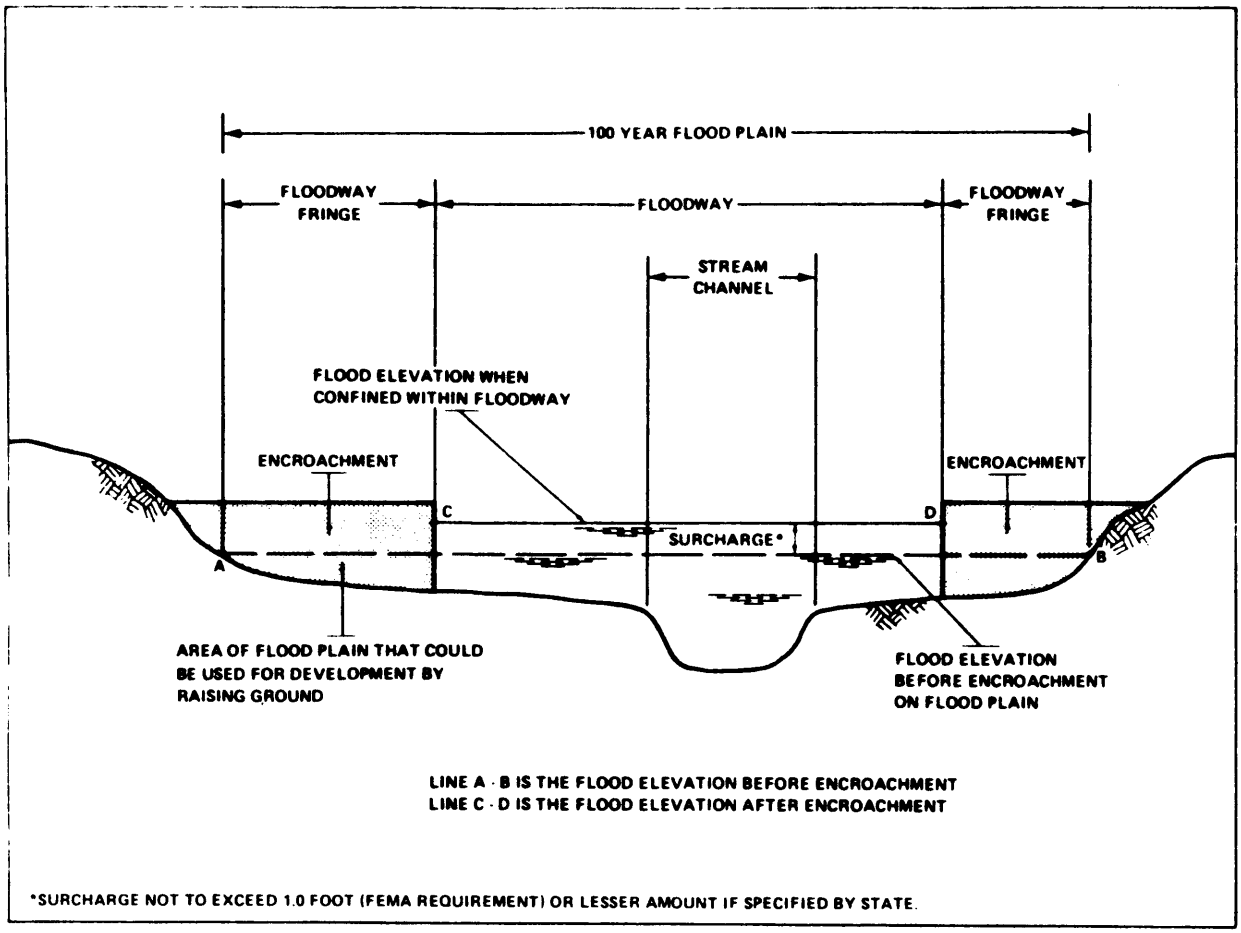
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FREEDOM, NY
(CATTARAUGUS CO.)

FLOODWAY DATA

CLEAR CREEK



FLOODWAY SCHEMATIC Figure 2

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for the Towns of Arcade, Farmersville, and Yorkshire (References 7, 8, and 9).

Because it is based on more up-to-date analyses, this study supersedes the previous Flood Insurance Study for the Town of Freedom (Reference 6).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, 26 Federal Plaza, Room 1351, New York, New York 10278.

9.0 BIBLIOGRAPHY AND REFERENCES

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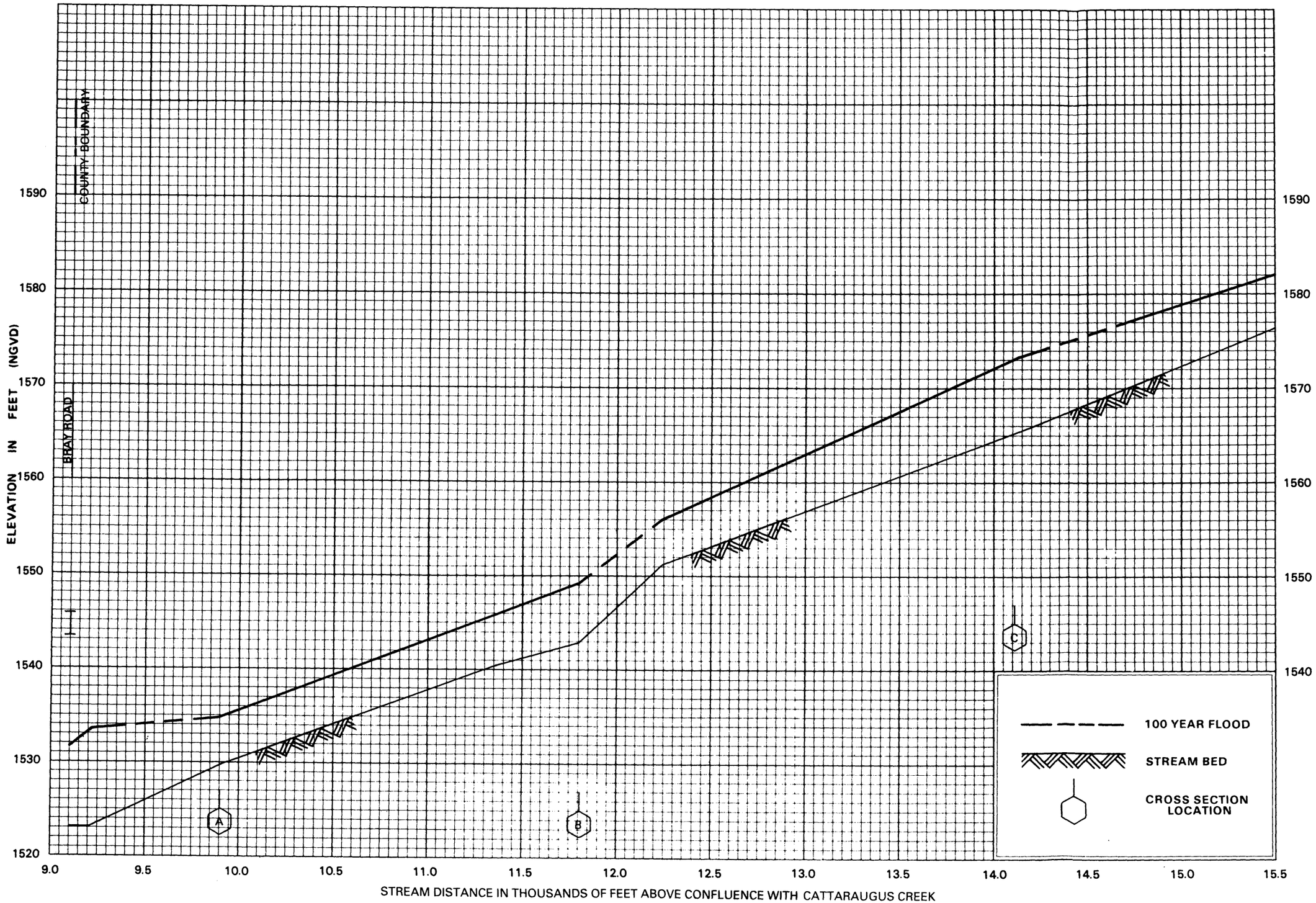
9. Federal Emergency Management Agency, Flood Insurance Study, Town of Yorkshire, Cattaraugus County, New York, Washington, D. C., May 25, 1984.



FLOOD PROFILES

CLEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FREEDOM, NY
(CATTARAUGUS CO.)

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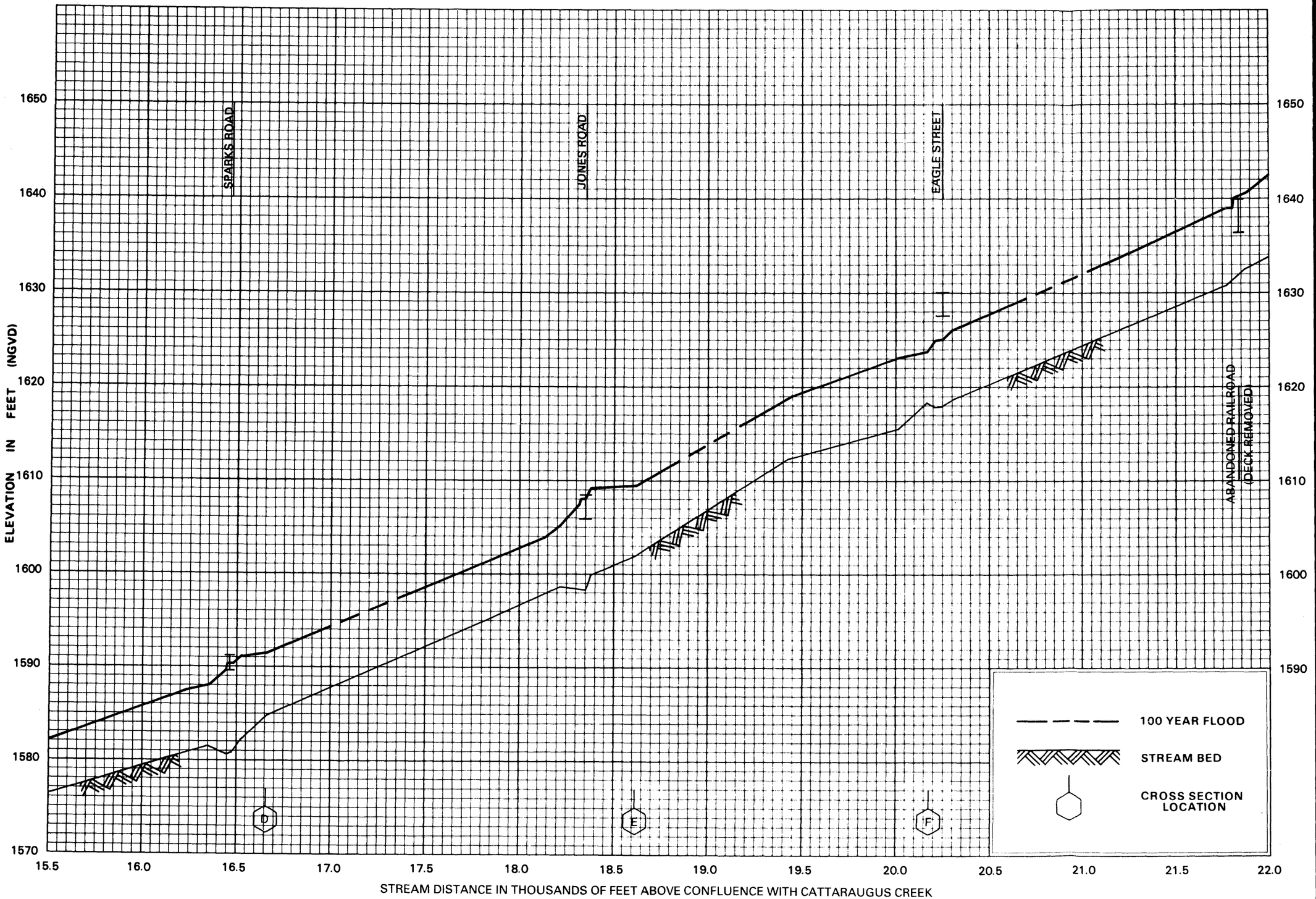

FLOOD PROFILES

CLEAR CREEK

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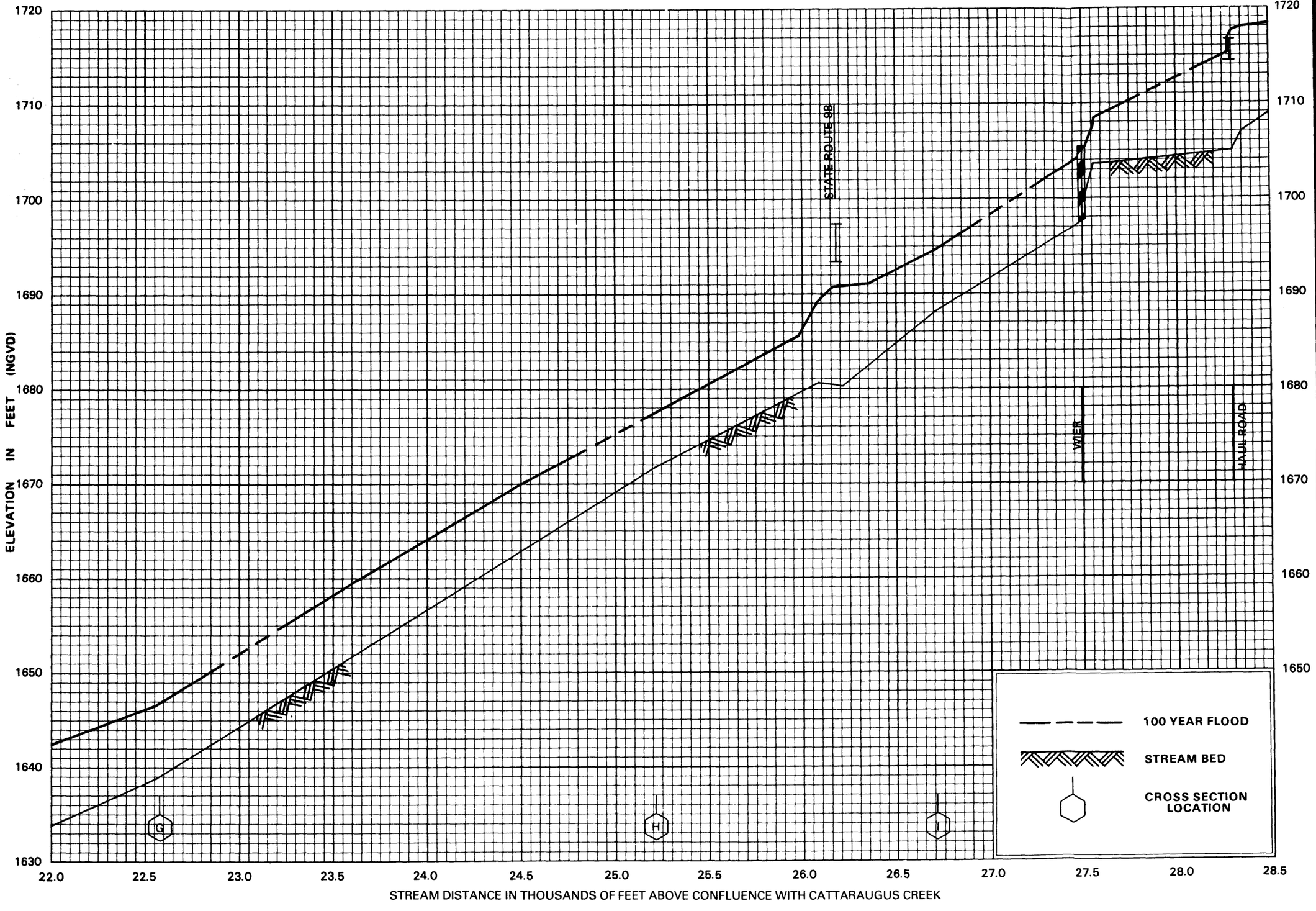
TOWN OF FREEDOM, NY
(CATTARAUGUS CO.)

02P



FLOOD PROFILES

CLEAR CREEK

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TOWN OF FREEDOM, NY

(CATTARAUGUS CO.)

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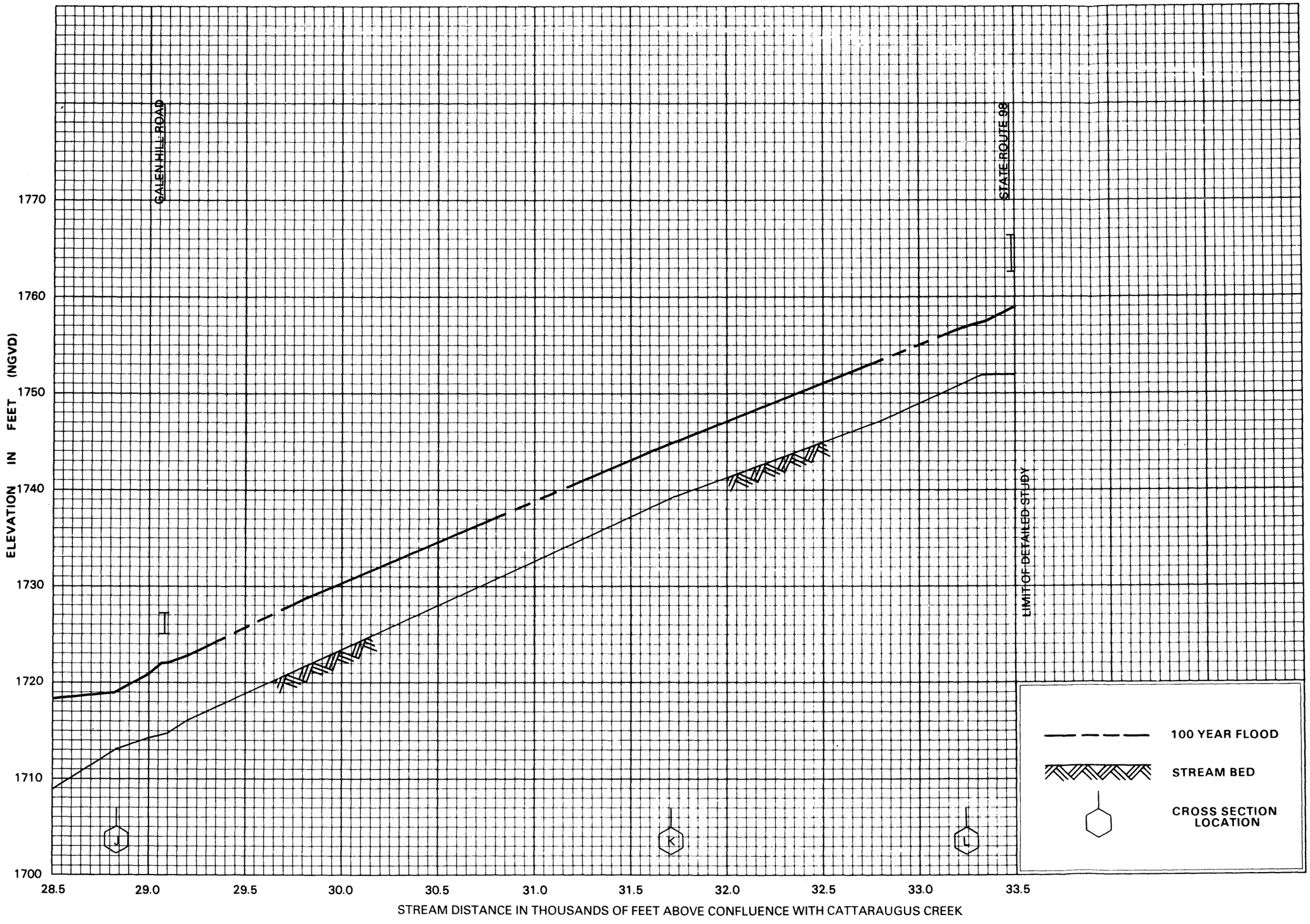

FLOOD PROFILES

CLEAR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF FREEDOM, NY
(CATTARAUGUS CO.)

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